INTRODUCTORY REMARKS

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Astrometry is the oldest branch of the oldest science. Traditionally, astrometry has been understood to mean the measuring of the directions of stars — either with respect to other stars or with respect to a somehow defined reference system. The definition and empirical realization of these reference systems is also part of astrometry. The astronomer is, however, interested not only in directions, but distances are important as well, even though these are much more difficult to obtain. For stars, there is no known way yet to measure them directly.

In order to specify completely the location of an object in space, we need directions and distances, in addition to a reference coordinate system whose origin must also be specified and whose axes must likewise point in specified directions.

The first time derivatives of the directions are the proper-motion components, and those of the distances are the radial velocities. These derivatives, together with the coordinates, specify completely the velocities of the object with respect to the chosen reference frame. I have always regarded it as a curiosity that of these, only proper motions, but not radial velocities were regarded to be in the domain of astrometry. The reason is quite apparently historical: Radial velocities were (and are) measured by "spectroscopists" who were careful not to allow themselves to be classified as astrometrists, or was it that the astrometrists regarded the spectroscopists as intruders who should not be admitted into the inner sanctum, even though they, as well, determined kinematic parameters? Today, meetings on astrometry would be woefully incomplete if they did not include interferometrists, radio astronomers, space astronomers, and representatives of other disciplines which were traditionally not measuring kinematic parameters but who have, relatively recently, developed an interest in such data.

It would thus please me enormously if astrometrists would agree that everyone who contributes to the measurement of any location parameters and kinematic parameters is an astrometrist, and if all those who measure kinematic parameters of any kind, thus also those who use the techniques of spectroscopy to measure radial velocities would consider their activity as **part of astrometry.** Astrometry **could then logically be defined as all that part of astronomy which**

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specifies reference coordinate systems and/or determines the (space) coordinates of celestial bodies and their derivatives. Only the future will show whether my colleagues will grant me this wish.

In astrometry, as in any discipline that has been around for a long time, there is a large body of existing knowledge. Likewise, as in any area of human enterprise in general and scholarly research in particular, there comes a time when traditional methods have been worked hard to the point of being wrung dry and when it becomes more and more difficult to do something essentially new. The area as a whole thus acquires easily the reputation of being old-fashioned. This is really quite unjustified, especially because something is not automatically outmoded because it has been around for a long time without any essential change. For instance, there are absolutely no serious suggestions for a refom of the way in which humanity perpetuates itself. Not only is there any prospect that astronomical and astrophysical research can ever be carried on successfully without the coordinates and velocities of the investigated objects being known, but the availability of completely new and within the lifetime of many of us still completely unsuspected availability of computers, space satellites, radio and optical interferometers and such has opened possibilities for astrometric research and brought about a revolution in available precision which thirty years ago the older ones among us would not have dared hope for even in their wildest dreams.

Astrometry must be healthy if astronomy is to be healthy, and I will even say that astronomy must be healthy if society is to be healthy. (While I am in principle ready to argue this particular point, I am not prepared to do this here and now). But in order to have healthy astrometry and therefore a healthy society, those of us who grew up in the traditional techniques of astrometry cannot afford to be ignorant of the new techniques and the new horizons, and we must not only tolerate but welcome with enthusiasm into our midst those who apply non-traditional methods of investigation to the tasks of astrometry. At the same time, those whose primary specialization started in fields other than astrometry, but who are now directing their efforts to the solution of astrometric problems must realize that the body of existing knowledge in a field that has been practiced as long as astrometry has been on the scene can be ignored only at the danger of falling into some of the same traps into which struggling astrometrists fell a couple of centuries ago. The organizers sincerely hope that this Symposium will make a significant contribution to the dialogue between the practioners of the various techniques within the community of astrometrists. Without such dialogues astrometry cannot prosper.

Astrometry shares another peculiarity with those disciplines that have been the property of the communion of scholars for a long time: many of the concepts with which it concerns itself, and many of the entities which it uses came into being at a time when no one did foresee — and very few could have foreseen — what astrometry would look like in 1984. Is it not quaint that we express right ascensions, say, in hours, minutes, and seconds of time, but declinations, which are also angles, in degrees, minutes and seconds of arc? As a matter of fact, it is not quaint that we are still using the hexagesimal system for measuring angles, while we of the scientific establishment frown upon those who do not want to adopt the metric system in their daily lives?

In the halcyon days of astrometry the ecliptic, then a readily available concept, defined by the apparent motion of the Sun, was naturally employed as one of the entities which determine the most frequently used coordinate system. Only within the last hundred years has it become apparent that the time-hallowed definition of the ecliptic which we still find in all undergraduate texts ("the apparent path of the Sun among the stars") is nowhere near sufficiently accurate. Everyone who has taken the trouble to keep current on the rigorous definition of the ecliptic knows how complicated, clumsy and really almost legalistically contorted this definition is. One might surmise that therefore the invariable plane of the solar system would supplant the ecliptic in the definition of the equatorial coordinate system. But this invariable plane is defined in terms of Newtonian mechanics and was therefore not yet available when the ecliptic was first considered by the astronomers a couple of millennia ago. And after all "we have always used the ecliptic". So why change now.

Sometimes, when I contemplate the concepts with which we deal in astrometry, I am struck by how many of them are really no longer useful and are being kept alive — in the form of amendments to the original definition piled on top of each other — by artificial respiration, as it were, even though other, albeit new, concepts could better perform their intended functions. This sometimes reminds me of certain biological species who, in the course of their evolution, have become so boxed into an environmental niche that they represent evolutionary dead ends doomed to extinction. Yet, life on this Earth goes on, even without those species.

We astrometrists, especially those of us enamored with tradition, can learn an important lesson from this. Astrometry will always be one of the necessary foundations for astronomy and astrophysics as a whole. This much is certain. But the rest of the discipline at large will pass us by and ignore us if we are not willing to give up those cherished concepts of the past which are losing their usefulness: An impatient community of astronomers may pour out the child with the bathwater, ignore the establishment of traditional astrometry, and build methods and concepts for the satisfaction of their astrometric needs without paying much attention to the existing body of knowledge. No one can deny that some, and perhaps much, of this has already occurred. This is a game with no winners.

The list of participants in this symposium illustrates better than any words the large variety of what is in this day and age astrometric technique and I am sure that we and with us, our science will profit significantly by becoming familiar with the papers in this volume.